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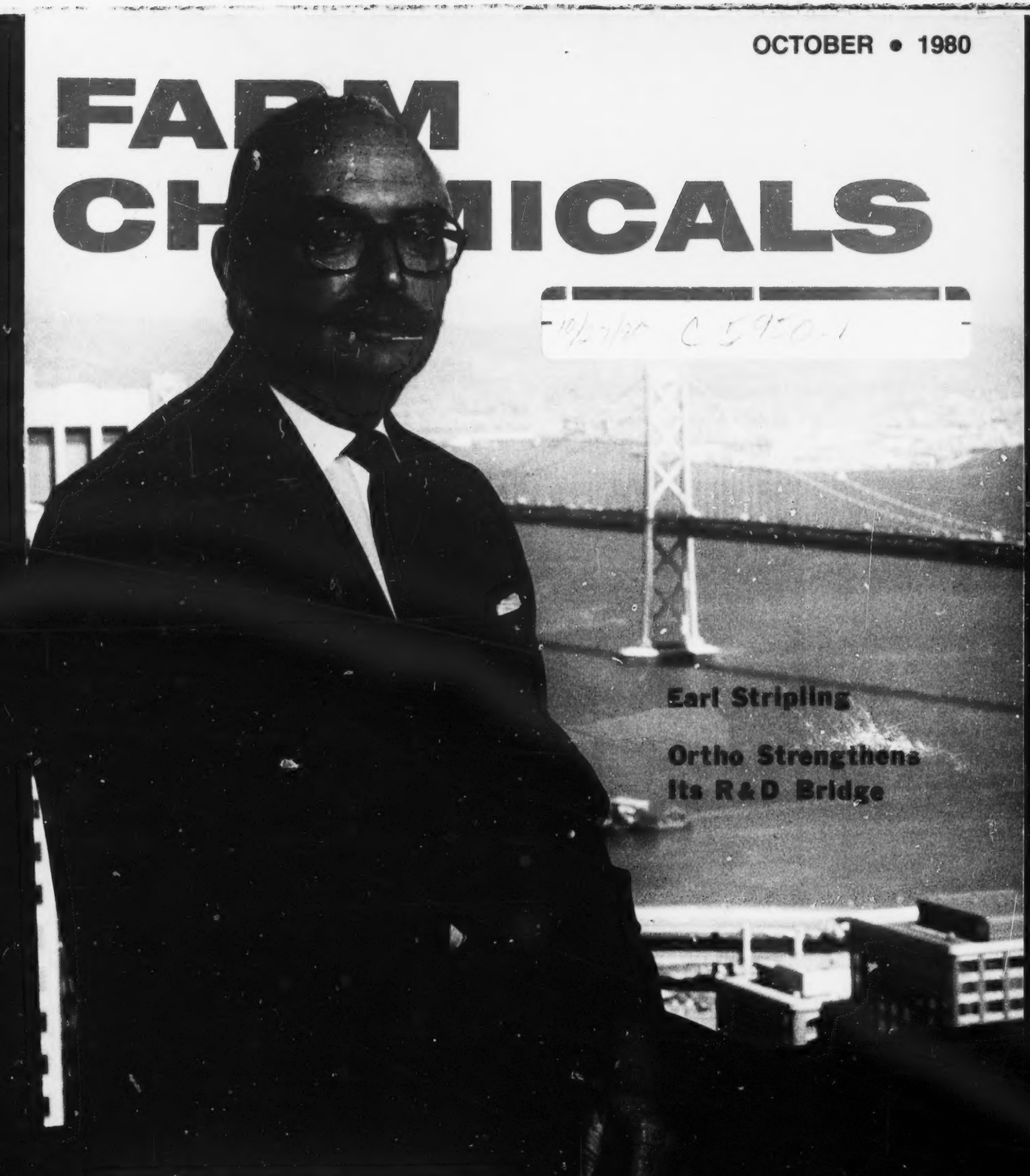

Earl Stripling

Ortho Strengthens Its R&D Bridge

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The Cover Story

Earl L. Stripling, Jr. is general manager of Chevron Chemical's Ortho Agricultural Chemicals Division. A veteran pesticide man, he looks to the future with enthusiasm, based on Ortho's current product line and new products to come. There is a big push being made in research at Ortho as the company makes a strong commitment to continue its position in U.S. and world markets. For the full story see page 13.

Global Agriculture Year 2000
A Strategic Analysis

This article doesn't give any predictions but it will help you in developing your own forecasts and strategy.

By STEWART G. STEARNS

In preparation for the recent establishment of the MSD AGVET Division by Merck & Co., Inc., two task force studies were commissioned and carried out over the past four years. Central to the study on agrochemicals was a strategic analysis of global plant agriculture, whose objective was to develop an envelope of Year 2000 global agriculture scenarios from which plausible outcomes could be selected and studied. No predictions were attempted.

Because of the importance and character of the forces for change shown below, single-minded preoccupation with the problems of the agricultural production system to the exclusion of political, social, and economic effects is no longer possible. Ironically, since many past agricultural problems were addressed during the period when energy intensive agriculture and a lower level of consumer and environmental awareness prevailed, solutions to these problems may often be questionable by today's standards—
Stewart Stearns

BUSINESS and agriculture have entered a period of unprecedented change which is forcing alterations in the methodology by which we seek to view the future. As John McHale puts it, "We have had more radical transformations of the human condition in the past 100 years than may have occurred in all recorded history—indeed most of this change has occurred in the last 50 years."

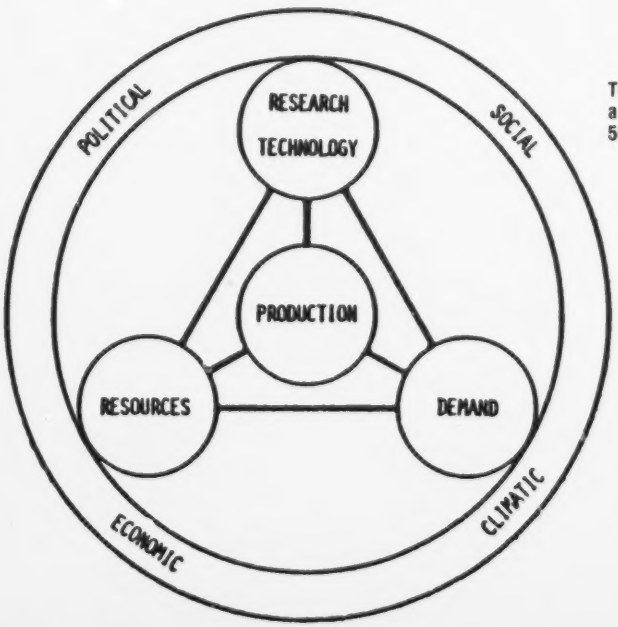
A basic factor is the accelerating growth of the world population. Between now and the year 2000, it will increase by 50% to 6 billion people. Although population increase is a powerful engine for agricultural growth, such inexorable growth produces political instability, a widening gap between developed and developing countries and, finally, intolerable demands on the world's capital and material resources. World population as well as the consumption of many ores and raw materials is now growing at an exponential rate.

The increase in our rate of travel speed (Figure 1) has facilitated the interdependence of society, the communication of ideas, the transport of man's goods and agricultural products, and even the exploration of space.

The increase in our ability to store and process information has been accompanied by a decrease in the time required to process data. Herman Kahn and his colleagues at the Hudson Institute forecast that by the year 2000 computer operating speeds will increase by factors of 10 to 1000 while storage capacity will increase by factors of 100,000 and upwards. The current trend toward faster, smaller, and cheaper computers and microprocessors has great implications for agriculture and agrometeorology in particular.

Man and his weapons have historically had powerful effects in the political arena. As a force for change, weaponry is becoming increasingly

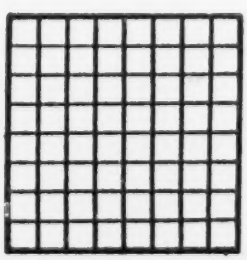
GLOBAL AGRICULTURAL SYSTEM



PLAN FOR GLOBAL AGROCHEMICAL STUDY

The agrochemical study was carried out by a five-member task force over a period of two years and involved 10 consultants, 75 university visits, 50 field visits, and a review of over 500 literature references.

CROSS IMPACT MATRIX



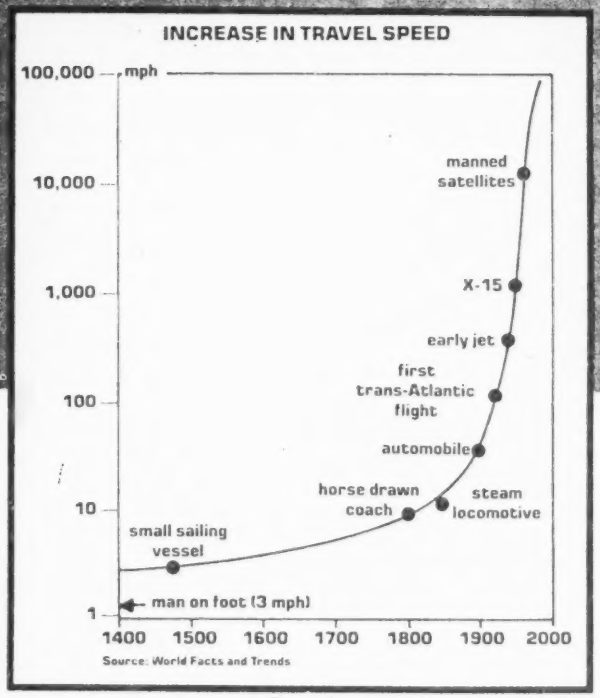


Figure 1

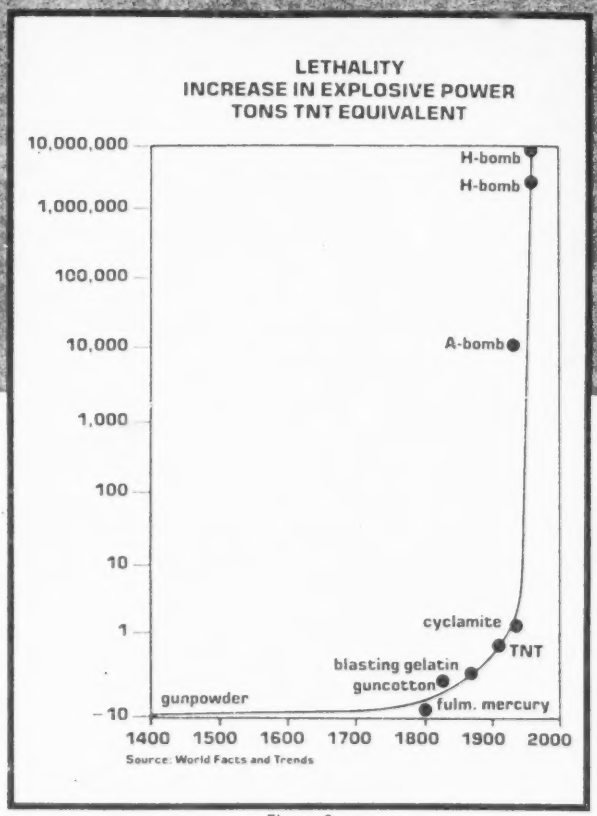


Figure 2

leveraged particularly as new nations join the "nuclear club." As the amount of energy at man's immediate command has increased, so has the lethality of his weapons (Figure 2).

Increases in the speeds of communication, transportation, and data processing and storage are narrowing the gap between scientific discovery, development, and large-scale application (Figure 3).

The time interval for adoption of new technology is similarly diminishing with the result that less time is afforded for critical assessment of social, political, and economic implications.

Some of the key elements in a plausible year 2000 scenario are as follows:

Demand

In the view of the task force, the year 2000 will see a world population of 6.9–6.25 billion with annual population increments of about 100 million per year, only 9% (about 9 million people) of which will be in developed countries.

Aggregate food demand in developed countries will be 50% higher than in 1978 while demand in developing countries will be 200% higher.

Aggregate food demand on a tonnage basis is expected to increase at 2.4–2.6% compounded growth rate to 2000. In the U.S., shifts in the age structure of the population will slow growth in the workforce, lower unemployment, and stimulate labor-saving technology, particularly in agriculture.

Physical resources will be generally adequate to sustain the population growth but capital demands by developing countries will strain free-world resources.

About 1.4 billion hectares of land are currently classed as arable. A further 1.7 billion hectares of land are potentially arable; however, the cost of development is estimated at $2.8 trillion. Land losses and degradation pose serious problems for world agriculture.

Energy will continue to be a rate-limiting factor with respect to the economy, relieved to some extent by new resource discoveries, new technology, and the use of agricultural crops or wastes directly or indirectly as energy sources.

Fertilizer and grain drying are two of the most important energy based agricultural inputs. The use of energy by agriculture as a percent of national requirements is low—less than 3% in the U.S. Consumption by the food chain represents over 16%. Economies in fertilizer timing and placement and use of solar drying for grain are the most obvious targets for agriculture.

The costs of fertilizer, probably the most important limiting factor in agriculture, will continue to rise, reflecting higher natural gas prices, while the center of gravity of the world fertilizer industry will migrate from the U.S. to OPEC countries because of natural gas availability.

Production

The two most important elements from the point of view of this study are yields and losses. In the developed world, production increases for such crops as corn, wheat, rice, potatoes, and sugarcane have been attained largely through yield increases. There is still, however, a wide margin between average and record yields which differ by as much as a factor of 3–8, while theoretical yields are even higher. *A 10% increase in yield for the top 19 crops is valued at over $30 billion.*

The costs of inputs and the rising value of land make yield-improving and loss-averting technologies of increased value. For the 19 major food crops, losses from insects, weeds, and diseases are estimated to cause $150 billion in lost production, of which $50 billion is caused by disease.

Developing countries will realize production increases largely by land-utilizing technology plus fertilizer and high yielding hybrids. Developed

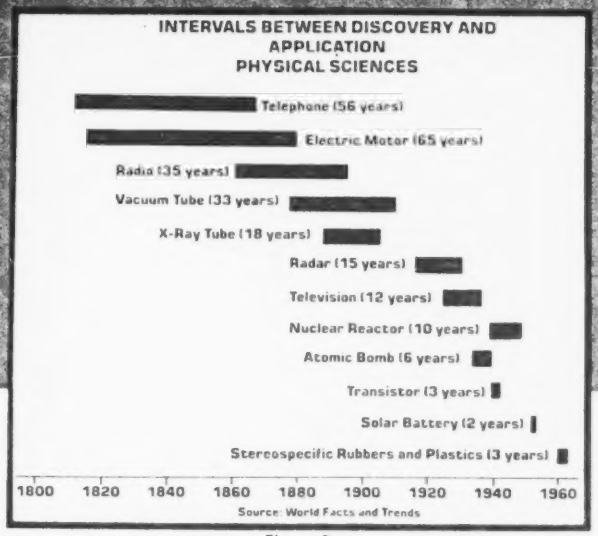

INTERVALS BETWEEN DISCOVERY AND APPLICATION
PHYSICAL SCIENCES
Telephone (56 years)
Electric Motor (65 years)
Radio (35 years)
Vacuum Tube (33 years)
X-Ray Tube (18 years)
Radar (15 years)
Television (12 years)
Nuclear Reactor (10 years)
Atomic Bomb (6 years)
Transistor (3 years)
Solar Battery (2 years)
Stereospecific Rubbers and Plastics (3 years)
1800 1820 1840 1860 1880 1900 1920 1940 1960
Source: World Facts and Trends

Figure 3

BENEFITS AND RETURNS FROM TECHNOLOGY AND SCIENCE ORIENTED RESEARCH U.S. 1868 — 1971

Subject	Annual Max Benefit $1,000 Inv.	Annual Rate return
	1868 — 1926	
All Ag. Research	$12,500	65%
	1927 — 1950	
Ag. Research		
Tech. - Oriented	$11,400	95%
Sci - Oriented	$53,000	110%
	1948 — 1971	
Ag. Research		
Tech. - Oriented	$12,000 - 21,000	95 - 130%
Sci - Oriented	$ 4,500	45%

Source: Science 205 1105 (1979)

countries will experience a yield plateau due to the depletion of 1940-type technology.

Research/Technology

Because of the decline in support for basic agricultural research, the agricultural technologies of the 1940s—chemical fertilizer, pesticides, and plant breeding, which have led to the impressive production increases in developed countries—have spent their force and have not been replaced by new discoveries. Yields of major crops in many developed countries have plateaued, and new basic research is needed to move off the yield plateau.

In spite of the decreasing support for basic agricultural research in the U.S. and elsewhere in recent years, a number of scientific developments have occurred which could have profound effects on efforts to prevent crop losses and to move upward from the present yield plateaus. These include advances in such areas as genetics, photosynthesis, improved nitrogen fixation by plants, plant cell culture, and non-conventional technology for plant breeding, including recombinant DNA methodology.

It is ironic that a system of public research such as agriculture continues to be undervalued. As Evenson, Waggoner, and Rutan state in a recent issue of *Science*, "Despite annual returns on the order of 50%, which an economist would call clear evidence of underinvestment, investment in agricultural research remains static." (Figure 4)

As a result of societal and in turn regulatory pressures, governments are increasingly intervening in the agricultural field through controls over land, water, and pesticide use, and in the agricultural chemical field through increasingly rigorous environmental requirements. These threaten the existence of a number of pesticides and increase the cost, time, and risks of new product discovery and development. For example, it now requires approximately 110 months from inception to full registration for a pesticide under existing U.S. policies.

A report in 1979 by a U.S. Senate subcommittee concludes that worldwide subsidies and protective devices insulate world agricultural export prices from movements in exchange rates. Devaluation of the dollar negatively affects export volume and reduces returns to growers. The U.S. cannot assume the continuation of its predominant position in world agricultural markets. U.S. soybean producers, for example, face competition from Argentina and Brazil as well as from palm oil and related oil seeds. The same goes for cotton, and Brazil has now replaced the U.S. as the world's leading exporter of concentrated orange juice.

Slowing economic growth in developed countries, particularly Western Europe, will lead to increasing protectionism and decreased trading prospects. Latin America can move past Europe as a trading partner. The U.S., whose exports are currently 6.4% of GNP vs. 12–15% for Western Europe and Japan, will increase to an estimated 7.5% GNP; but its share of world exports will fall from 13% to 8% under pressure from rapidly industrializing lesser developed countries.

Agricultural products from the U.S. will, however, continue to be in great demand, but the U.S. position cannot be taken for granted.

Social pressures on food prices are high, and the grower is squeezed by rising costs of inputs and downward pressure on prices. This is causing grower unrest.

Economic

Rising costs of agricultural inputs and land values on the one hand and downward pressures on food prices on the other will lead to increasing grower unrest and militancy as well as the retirement of less efficient farmers.

It is startling to find that in many developed countries half or more of farm income is derived off-farm. Thus the marginal farm is being subsidized.

The rising value of farmland and the cost of acquiring new land is swelling farm debt, particularly in the U.S.

The capital requirements for farming are rapidly putting farming beyond the reach of the small farmer and new entrant.

Climate

Over the next 25 years northern hemispheric weather is expected to become increasingly variable which, together with a further cooling trend, will affect yields.

Since 1880 and until 1940, the average northern hemisphere temperature increased by 6°C. This period was extremely favorable for world and particularly U.S. agriculture. Since 1940 temperature has begun to fall, and there are strong indications of a return to the variable and unfavorable climate of the late 1800s.

The effects of these changes on yields are already evident in the U.K. and Canada where harvests are now occurring 7–9 days earlier than they were in the '40s. Wetter springs prevent the entry of equipment into fields, while earlier falls shorten the growing season. FC

Dr. Stearns is manager of strategic research for Merck & Co., Inc. Rahway, NJ.

For Details Circle No. 161 on Postcard

Illuminating Some Obfuscation About Pesticide Safety

Obfuscate: To darken by or as by depriving of light; to render obscure; to deprive of mental clearness; confuse; bewilder.

That's what some of the environmentalists have been doing when it comes to facts and figures on pesticides and safety.

By KEITH C. BARRONS

OBFUSCATE—to confuse or perplex. So sayeth my dictionary. The word has not been a part of my vocabulary, but it seems to best describe the careless or purposeful way data of questionable validity is sometimes thrown around, even by university professors with presumed dedication to the truth. I hope to throw light on some recent obfuscation of the subject of pesticide safety.

Not long ago I had occasion to review data on the incidence of lethal episodes in the U.S. in the category "accidental poisonings by pesticides, fertilizers or plant foods," as recorded since 1968 by the National Center for Health Statistics. Their numbers reflect mainly accidental deaths and do not include deaths reported as suicides or homicides. The Center's tabulation of mortalities in this category as published in *Vital Statistics of the United States* is as follows:

1968—72	1973—32
1969—56	1974—35
1970—44	1975—30
1971—43	1976—31
1972—38	1977—34

The U.S. Environmental Protection Agency (EPA) has made estimates of the deaths associated with pesticide exposure (accidental plus intentional) by projection from data recorded by representative hospitals in different regions of the country. Relatively few of the observed episodes in this study were occupationally related. The estimated average number of mortalities attributable to pesticides for 1971 through 1976 (the years for which the statistical projections have been completed) is 53.

Considering that this number includes suicides and homicides while the average of 35 recorded by the Center for Health Statistics for the same years (1971–76) involves only accidents, the two sets of data appear in sufficient agreement to justify confidence in their validity.

Then I read on page 248 of Dr. Samuel Epstein's book, *The Politics of Cancer*,[1] ". . . . approximately 200 people estimated by EPA die annually from pesticide poisoning . . . ." How come data sent me by EPA averaged 53 while Epstein attributed the number 200 to the same source? I will risk possible misuse of the term to say I was badly *obfuscated*.

Although Epstein did not document his data beyond attributing it to EPA, he appeared to be quoting David Pimentel. Then in a new book of which Pimentel is co-author[2] I found the statement, "The total estimated mortality from pesticides is about 200 per year (EPA 1976)." Turning to the book's page of references I found that the EPA publication cited[3] was precisely the one I had used, along with subsequent data sent me by EPA,[4] for the derivation of the average of 53 lethal incidents for the years 1971–1976. A further study of these EPA reports confirmed that neither the data nor the accompanying discussions said anything about 200 mortalities per year. I was still *obfuscated*.

Possibly the 200 figure of Pimentel (as apparently quoted by Epstein) came from Table 101 of the 1976 EPA document.[3] This table summarized the projected lethal incidents for the entire period covered by that report—a total of 200 over three years. This is an average of approximately 67 per year. The lower average of 53 for the total span of these EPA records as referred to in the above paragraph reflects a marked reduction for the last three years that data has been made available, 1974–1976.[4]

In the literature review on page 1 of the 1976 EPA publication,[3] I did find the following statement: "It has been estimated that mortality resulting from pesticide intoxication approaches one death per million population annually." This carried a reference to a 1964 paper by Dr. Wayland J. Hayes, Jr.,[5] now of Vanderbilt University and author of the book, *The Toxicology of Pesticides*.

The literature review in the EPA document was obviously intended to give a comparison of mortalities in earlier years with more recent experience as set forth by the data contained therein. Possibly the 200 figure of Pimentel and Epstein came from this estimate, considering that U.S. population had passed the 200 million mark when they did their writing. But note the 1964 date on the paper by Hayes in which this statement appeared.

Dr. Hayes and his colleagues have performed a valuable service by critically analyzing available information on mortalities, including a review of death certificates for certain years. In table 11 of the latest report of their findings,[6] they present the number of

About the Author

Dr. Keith C. Barrons' career spans both industry and research. He has been a plant breeder for Burpee Seed Co., member of the faculty of Auburn University and Michigan State University, and an agricultural technologist with Dow Chemical Co. He is co-developer of the Great Lakes lettuce variety and has authored more than 100 papers and patents relating to vegetable crop breeding and chemical weed control. His accomplishments also include discovery of dalapon herbicide.

In 1975 Dr. Barrons published the book *The Food in Your Future—Steps to Abundance*. Written for the layman, it offers valuable insight into what is required to ensure an abundance of reasonably priced food.

This article is excerpted from his forthcoming new book, *Are Pesticides Really Necessary? A Look At Both Sides of the Coin*, to be published in 1981 by Regnery/Gateway, Inc., Chicago.

deaths associated with pesticide poisoning for all those years in which they carried out detailed studies as follows:

1956—152
1961—111
1969— 87
1973— 61
1974— 52

As in the EPA study they found most lethal episodes to be non-occupational in nature. Accidents included drinking a pesticide kept in unlabeled soft drink or liquor bottles; storages accessible to children or the incompetent; grossly careless use of fumigants or poison baits; allowing children to play around a loaded sprayer where valves could be opened. According to the death certificates reviewed, several victims were intoxicated with alcohol when the careless pesticide exposure occurred.

The reference to one mortality per million in Dr. Hayes' 1964 paper was a valid estimate for years prior to that writing. However, a review of his more recent data above, together with that from EPA and the National Center for Health Statistics, should convince anyone that Pimentel's and Epstein's 200 figure could grossly mislead the public as to recent experience.

It is inconceivable that neither of these authors had at hand the publication by Hayes and Vaughan[6] which appeared in a respected journal. They surely must have had the entire 300-page 1976 EPA report [4] and not just the three pages devoted to a literature review or Table 101 which was misread. One wonders why they did not refer to data from the National Center for Health Statistics as published in *Vital Statistics of the United States*, a reference book found in every university library.

Attributing data to EPA that erred by a factor of three or passing off a 20-year-old estimate to the unsuspecting public while ignoring an abundance of more recent data that documents a marked reduction in mortalities is hardly the kind of scholarship expected of university professors.

A glance at the accompanying table, which presents U.S. lethal poisoning data for various classes of substances for the years 1975–1977, as collected by the Center for Health Statistics (the last three years for which figures have been published at this writing) will indicate their relative importance as causes of mortality.

Records of acute poisoning cases admitted to a hospital for treatment are believed by EPA [3] to "provide the best potential for a reliable data source." That agency's estimates of U.S hospital admissions resulting from pesticide poisoning for the years 1974–1976, the last three years for which their statistical projections have been completed, are presented in the accompanying table.

Lethal Poisonings in U.S. (Various Substances)
Source: Center for Health Statistics

Type of Poisoning	Number of Deaths		
	1975	1976	1977
Total lethal poisonings	6271	5730	4970
Gases and vapors	1577	1569	1596
Drugs and medicaments	3132	2839	2214
Other solids and liquids (excluding agricultural chemicals)	1532	1291	1126
Pesticides and Plant Foods	30	31	34

Estimated Hospital Admissions from Pesticide Poisonings
Source: Environmental Protection Agency

Year	Occupational	Non-Occupational (including unclassified)	Intentional	Total
1974	686	1733	535	2954
1975	985	1830	499	3314
1976	685	1879	446	3010

All statistics on pesticide-related mortality and morbidity indicate that children account for a distressingly high proportion of victims. According to EPA estimates nearly 40% of hospital admissions in the non-occupational column in the accompanying table were under five years of age. Let us hope that future statistics will show a safety benefit from the elimination of the more toxic materials from home and garden use. Let us further hope that with our current drive toward safer application procedures, secure storage, more careful container disposal, and precautions regarding re-entry time, the occupational column will show a downward trend.

In recent years fear of cancer has dominated concerns for the safety of all classes of substances including pesticides. The public needs reminding that:

1. No instance of human cancer associated with the approved use of any pesticide has even been documented.
2. For more than two decades all prospective new pesticides have been evaluated for carcinogenicity in laboratory animals, and only those found to be free from tumor-inducing effects (and otherwise safe from the toxicological standpoint) have been commercialized.
3. A number of older pesticidal chemicals found to have a carcinogenic potential when retested on laboratory animals have been removed from the market.

The public should also be reminded that older pesticides that have been banned or uses restricted because of carcinogenicity caused tumors in laboratory animals only at doses considerably exaggerated over likely human exposure. Even though one subscribes to the philosophy of the Delaney Clause and believes that response to relatively high doses in animals is evidence that traces of a substance may cause an occasional cancer in humans he must recognize that the odds are very, very slight. Those who believe that the body's natural defense mechanisms prevent traces of substances from inducing cancer will have no concern. With respect to non-carcinogenic risks, the public needs to be reminded of the very wide margin for safety that regulatory authorities provide when establishing permissible tolerances in foods. **FC**

References Cited

1. *The Politics of Cancer*. By Samuel S. Epstein. Sierra Books, San Francisco. 1978
2. *Pest Control: Cultural and Environmental Aspects*. By David Pimentel and J.H. Perkins, eds. Westview Press, Boulder, CO. 1980
3. National Study of Hospital Admitted Pesticide Poisonings (1971–1973). U.S. Environmental Protection Agency, Washington, D.C. 1976
4. The National Study of Hospital Admitted Pesticide Poisonings for 1974–1976. A yet unpublished document supplied by the Human Effects Monitoring Branch, Office of Pesticide Programs, U.S. Environmental Protection Agency, Washington, D.C.
5. *Toxicological Problems Associated with the Use of Pesticides*. By Wayland J. Hayes, Jr. Industrial and Tropical Health:V. Published for the Industrial Council for Tropical Health by the Harvard School of Public Health, Boston. 1964
6. "Mortality from Pesticides in the United States in 1973 and 1974." By Wayland J. Hayes Jr. and William K. Vaughn. *Toxicology and Applied Pharmacology* 42: 235–252. 1977